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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
AUSTIN, AARON	

ART UNIT	PAPER NUMBER
1775	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/624,254	KIM ET AL.	
	Examiner	Art Unit	
	Aaron S. Austin	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,11-13,25,27-31 and 33-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,11-13,25,27-31 and 33-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 and 11-12 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The step of cryomilling a NiCrAlY powder prior to thermally spraying the cryomilled powder appears to be critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). To achieve the nanocrystalline, nano-composite bond coat, the step of cryomilling appears to be essential in forming the article, and as such, this limitation should be in the independent claims.

Claims 37-40 and 43 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, in claim 37, line 4 and claim 43, line 44, the recitation of a "fully nanocrystalline MCrAlY" is not supported by the specification.

Claims 41-42 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, in claim 41, lines 4-5, the recitation of a "bond coat on the substrate composed of more than 30% by volume nanocrystalline MCrAlY" is not supported by the specification.

Claims 43 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, the recitation of cryomilling at low speed of below 450 rpm is not supported by the specification.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1,11-13, and 44-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, line 4 and claim 13, line 3, the recitation of "a bond coat composed substantially only of" is ambiguous. The term "substantially" implies other

elements may be present whereas the term "only" does not permit the presence of other elements. The terms are contradictory imparting upon the claims ambiguity.

Regarding claim 1, line 5 and claim 13, line 4, the recitation of "either Co, Ni, and/or Fe" is an improper Markush group.

Claim 11 recites the limitation "nano-composite bond coat" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Regarding claim 13, lines 6-7, the recitation of "onto a metallic substrate on the substrate" is redundant and confusing.

Claim 13 recites the limitation "nanostructured, nano-composite bond coat" in line 7. There is insufficient antecedent basis for this limitation in the claim.

Claims 25 and 27-30 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship between the nanocrystalline nano-composite and the MCrAlY bond coat. In particular, the MCrAlY powder forms the MCrAlY bond coat, yet also is cryomilled to form the nano-composite coating. How are two separate layers, one "on" the other, formed of the same material? Does the term "only" limit the formation to refining the microstructure of the underlying MCrAlY bond coat? If so, how are two layers formed if the underlying layer is the one refined?

Claims 25 and 27-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 25 and 28-30, the requirement that the nanocrystalline nano-composite bond coat is provided only by refining the microstructure of the MCrAlY powder is unclear. Does the term "only" imply nothing is added in the process as indicated on page 13, lines 14-17 of Applicant's response? If so, then how is this reconciled with the addition of alumina particles as claimed in 28-30.

Claims 33-36 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship between the nanostructured nano-composite bond coat and the MCrAlY bond coat. In particular, the MCrAlY powder forms the MCrAlY bond coat, yet also is cryomilled to form the nano-composite coating. How are two separate layers formed of the same material, especially if the underlying layer is the one refined to form the second layer?

Claim 34 recites the limitation "powder nanocrystalline size MCrAlY grains" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

Claims 38-40 and 43 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship between the nanoparticle additive and the fully nanocrystalline MCrAlY bond coat. In particular, Applicant has stated the bond coat is required to be "fully nanocrystalline and not only an in situ alumina" on page 13, lines 17-18 of Applicant's response. How is it possible for the bond coat to be "fully nanocrystalline" if it includes alumina nanoparticle additives? Or does "fully nanocrystalline" refer to the MCrAlY in the bond coat alone?

Claim 42 recites the limitation "the fully nanocrystalline MCrAlY" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 13, 25, 27, 31, 33, 37, and 41 are rejected under 35 U.S.C. 102(e) as being anticipated by Hebsur (US 6,805,725).

Hebsur teaches a bond coat comprising NIiAl and CoCrAlY which is cryomilled in nitrogen, and plasma sprayed onto a substrate. A ceramic top coat is formed over the bond coat. During cryomilling, AlN particles are formed in the bond coat and have a particle size of 10-50 nanometers. This is considered nanostructured. The bond coat is formed via a method that is commensurate with that of the instant specification; therefore the article is expected to share similar characteristics.

Regarding claim 37, the MCrAlY layer will be crystallized as like materials are used in a like manner to the claimed invention. Please note, the recitation of "nanocrystalline" is interpreted as meaning a crystalline form measurable on a nanoscale as no size limitation is provided by the claims.

Regarding claim 41, Hebsur teaches "about 30%" by volume CoCrAlY which falls within the range of greater than 30% by volume.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebsur (US 6,805,725).

Hebsur '725 teaches a bond coating formed via cryomilling as discussed above, but does not teach cryomilling at a speed below 450 rpm. However, it would have been

obvious to one having ordinary skill in the art at the time of the invention to adjust the cryomilling speed for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 45, as Hebsur '725 uses like materials in a like manner, the Examiner takes the position that the cryomilling occurs with an equivalent model to the 1-S attritor.

Claims 11, 12, 28, 29, 34, 35, 38-39, and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebsur (US 6,805,725) in view of Hebsur et al. (US 5,635,654).

Hebsur '725 teaches a bond coating formed via cryomilling as discussed above, but does not teach formation of aluminum oxide during cryomilling.

Hebsur '654 teaches a bond coating similar to that of Hebsur '725, and further teaches that depending on the material system being used, cryomilling can be reacted with nitrogen or oxygen. As discussed in both patents, nitrogen forms AIN particles in the bond coating, and Hebsur '654 teaches that oxygen forms alumina on the powder particles. As Hebsur '654 teaches that NiAl may be cryomilled with oxygen or nitrogen depending upon the material system being used, it would have been obvious to one of ordinary skill in the art at the time of the invention that the bond coating of Hebsur '725 could also be cryomilled with oxygen. Furthermore, Hebsur teaches that the net result of milling NiAl in liquid nitrogen is an arrangement of fine particles of AIN, NiAl, and

alumina on the NiAl powder surface (col. 2, lines 15-22). With this teaching it is expected that the bond coat of Hebsur '725 would already possess alumina particles in addition to the AlN particles.

Claims 31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebsur (US 6,805,725) in view of Cybulsky et al. (US 6,168,875).

Hebsur '725 teaches a bond coating formed via cryomilling as discussed above, but does not teach formation of a MCrAlY bond coat between another bond coat and a substrate.

Cybulsky et al. teach application of a MCrAlY bond coat between another bond coat and a substrate. Therefore, as Cybulsky et al. clearly teach a bond coat located between another bond coat and a substrate provides the advantage of oxidation and hot corrosion protection (column 2, lines 25-27), it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to form the bond coat of Hebsur '725 over an MCrAlY layer overlying a substrate. Thus the claimed invention as a whole is *prima facie* obvious over the combined teachings of the prior art.

Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebsur (US 6,805,725) in view of Cybulsky et al. (US 6,168,875).

Hebsur '725 in view of Cybulsky et al. teaches a bond coating formed via cryomilling as discussed above, but does not teach formation of aluminum oxide during cryomilling.

Hebsur '654 teaches a bond coating similar to that of Hebsur '725, and further teaches that depending on the material system being used, cryomilling can be reacted with nitrogen or oxygen. As discussed in both patents, nitrogen forms AIN particles in the bond coating, and Hebsur '654 teaches that oxygen forms alumina on the powder particles. As Hebsur '654 teaches that NiAl may be cryomilled with oxygen or nitrogen depending upon the material system being used, it would have been obvious to one of ordinary skill in the art at the time of the invention that the bond coating of Hebsur '725 could also be cryomilled with oxygen. Furthermore, Hebsur teaches that the net result of milling NiAl in liquid nitrogen is an arrangement of fine particles of AIN, NiAl, and alumina on the NiAl powder surface (col. 2, lines 15-22). With this teaching it is expected that the bond coat of Hebsur '725 in view of Cybulsky et al. would already possess alumina particles in addition to the AIN particles.

Response to Arguments

Applicant's arguments filed March 13, 2006 with respect to rejection of claims 1 and 11-12 under 35 USC 112 first paragraph as recited in the previous Office Action have been fully considered but they are not persuasive. Applicant argues the claimed steps are enabled and rejection as being broader than the enabling is improper. However, Applicant has failed to provide a convincing argument as to why the step of cryomilling is not essential and has failed to provide support for a process without the step of cryomilling. Applicant's arguments relating to the prior art uncovered by the Examiner emphasize cryomilling (particularly at a lower speed than that required by

Hebsur '725) as a distinguishing characteristic of the claimed invention. It is the Examiner's position that cryomilling is essential for the claimed invention. Therefore the rejection on this basis is maintained.

Applicant's arguments, see the reply filed March 13, 2006, with respect to rejection of claim 13 under 35 USC 112 first paragraph as recited in the previous Office Action as being a composition of matter have been fully considered and are persuasive. The rejection of claim 13 on this basis has been withdrawn.

Applicant's arguments, see the reply, filed March 13, 2006, with respect to rejection of claims 11, 30, 31, and 36 under 35 USC 112 second paragraph as recited in the previous Office Action have been fully considered and are persuasive in light of the present amendments. The rejection of claims 11, 30, 31, and 36 on this basis has been withdrawn.

Applicant's arguments filed March 13, 2006 with respect to the prior art rejections have been fully considered but they are not persuasive. Applicant argues Hebsur '725 does not disclose nanostructured particles and expresses doubt over whether the matrix taught is nanocrystalline. This argument is not found to be persuasive as the matrix of Hebsur is measurable on a nano scale and is therefore nanostructured within the meaning of the claim.

Applicant then argues Hebsur '725 teaches a system predominantly comprising NiAl and that the amount of CoCrAlY present is small in comparison with the present

invention. However, this argument is not commensurate with the claims. The claims do not limit the amount of CoCrAlY to an amount not taught by Hebsur '725 as outlined above.

The remainder of Applicant's arguments are addressed as set forth above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron S. Austin whose telephone number is (571) 272-8935. The examiner can normally be reached on Monday-Friday: 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ASA

JENNIFER C. MCNEIL
SUPERVISORY PATENT EXAMINER
8/20/06